Water impacts of Canadian resource exports to China and America

Steven Renzetti
Department of Economics, Brock University
Scientific Director, Water Economics, Policy and Governance Network

The Thirsty Triangle: The Water Footprint of Energy Trade Between China, Canada, and the United States

May 03, 2013

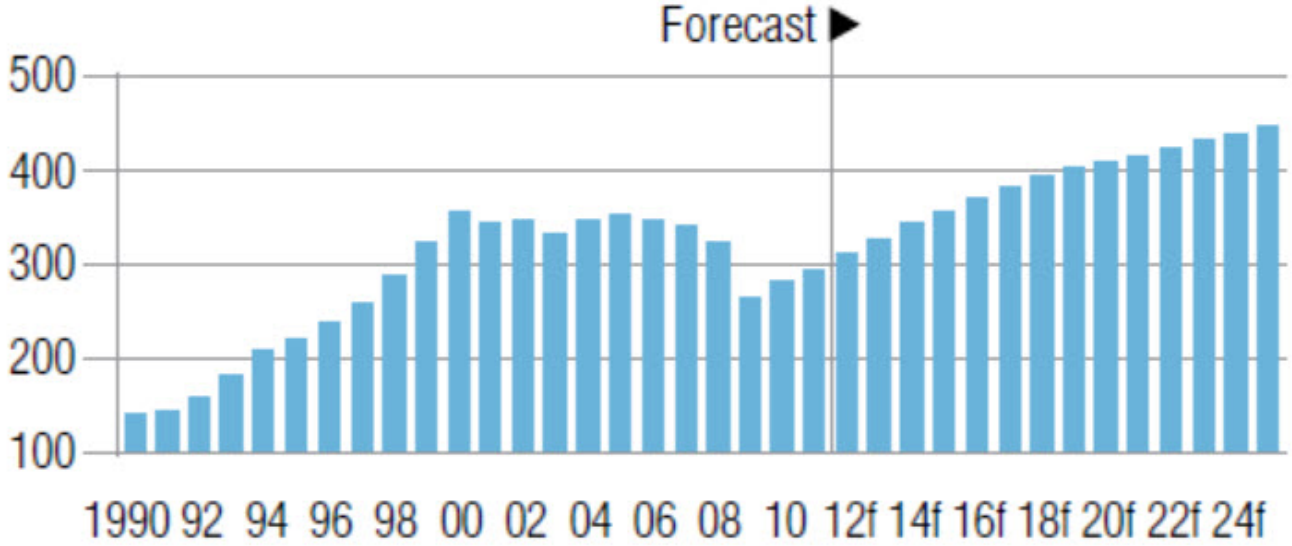
Canada Institute, Woodrow Wilson Centre

Outline

1. Canadian exports
2. Water use in Canada's NR sectors
3. Water quality in Canada

Canada's exports to US

Chart 7
Merchandise Exports From Canada to the U.S. Will Rise Gradually
(constant C$ billions)



f = forecast
Sources: Industry Canada; The Conference Board of Canada.

Canada's exports to US

Table 3
Mineral Fuels Now Top Canadian Merchandise Exports to U.S.

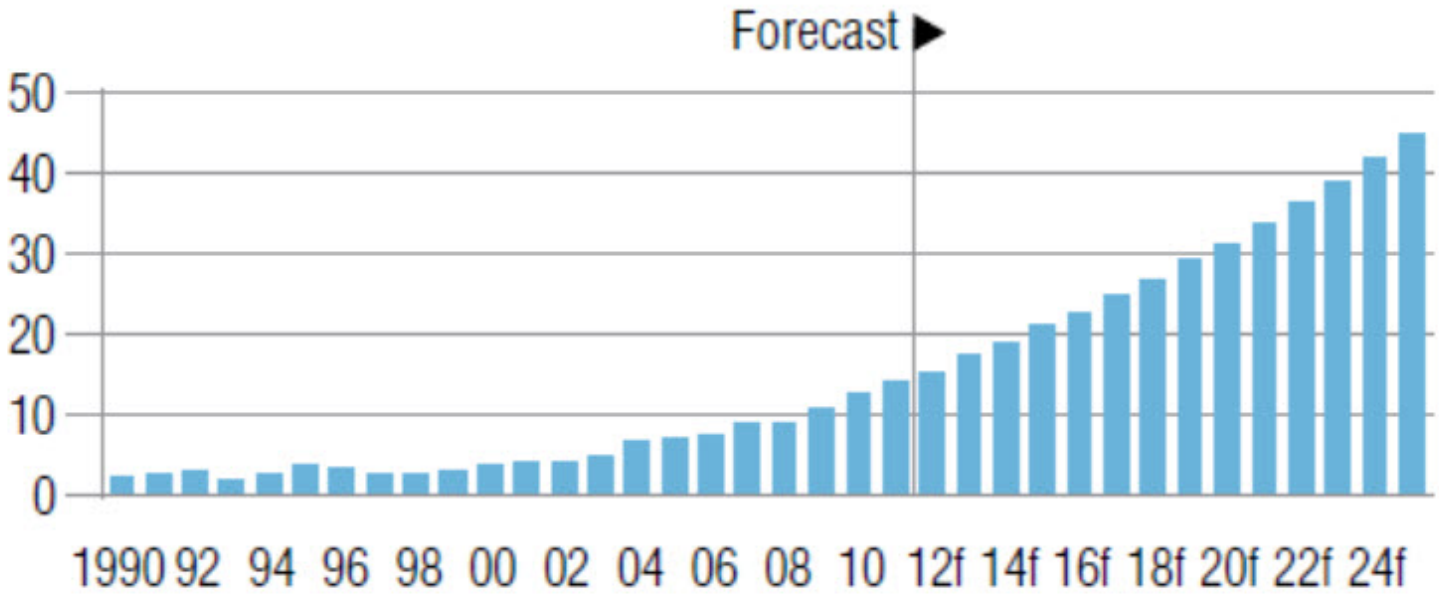
Rank	2000	2011
1	Motor vehicles	Mineral fuels
2	Mineral fuels	Motor vehicles
3	Machinery	Machinery
4	Electrical	Plastics
5	Wood	Electrical

Source: Industry Canada.

Canada's exports to China

Chart 14

Merchandise Exports From Canada to China Will Keep Soaring
(constant C$ billions)



f = forecast
Sources: Industry Canada; The Conference Board of Canada.

Canada's exports to China

Table 5
Raw Materials Comprise Canada's Top Five Merchandise Exports to China

Rank	2000	2011
1	Pulp	Pulp
2	Motor vehicles	Ores
3	Fertilizers	Wood
4	Oil seeds	Mineral fuels
5	Machinery	Oil seeds

Source: Industry Canada.

Canada's exports to China

Canadian Exports to China by Product, 2010
(per cent of total)

Pulp	15.09
Canola	12.42
Coal	7.60
Iron Ore	6.09
Lumber	5.30
Nickel	4.96
Copper	3.60
Chemicals	3.22
Fertilizers	2.46
Copper Waste and Scrap	2.24
Crustaceans	1.57

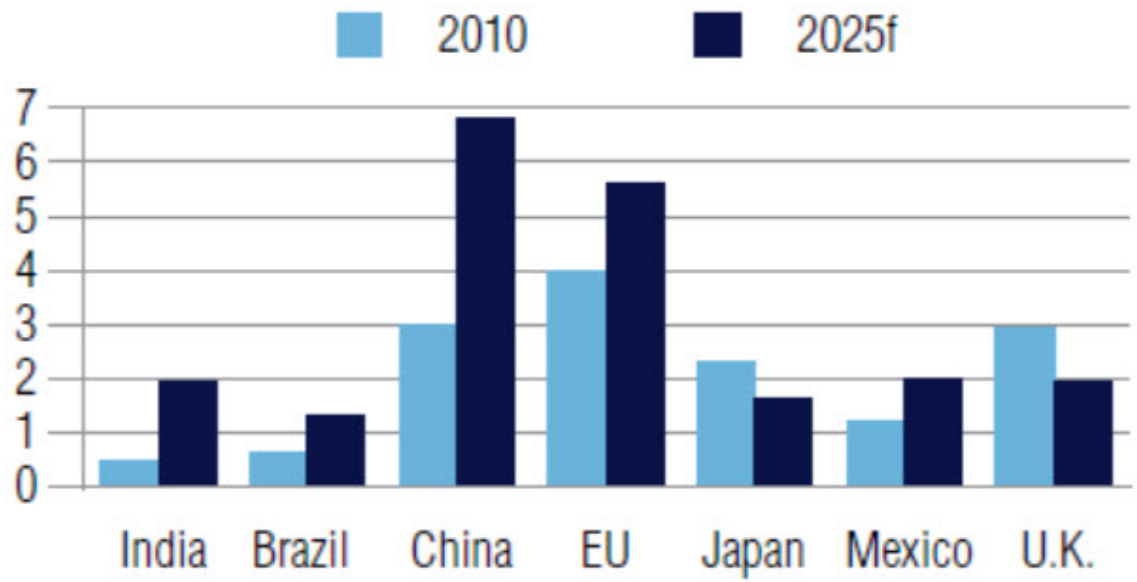
Source: Statistics Canada.

Canada's exports

Chart 10

Share of Canada's Merchandise Exports to Different Regions Will Vary

(percentage share of total)

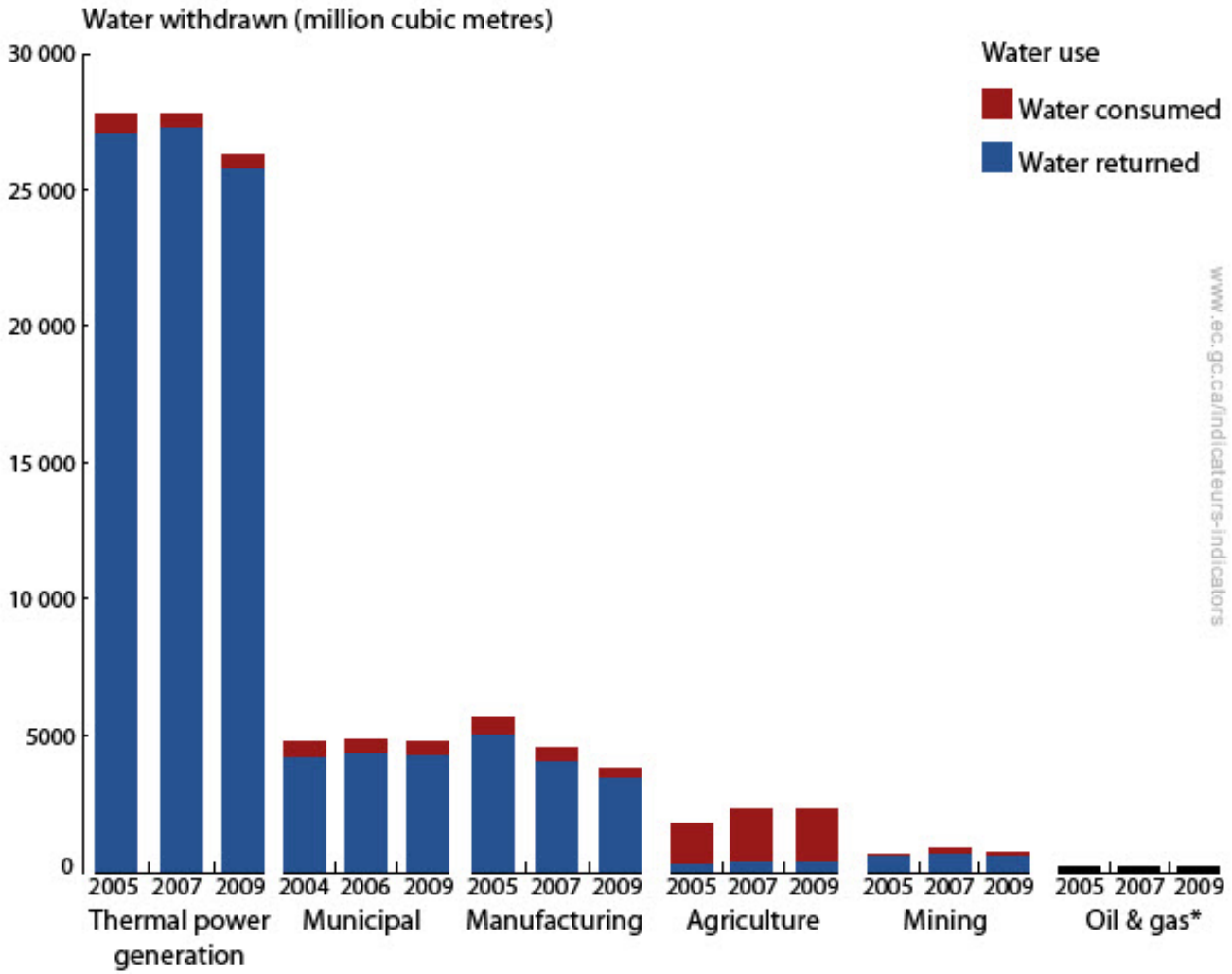


f = forecast

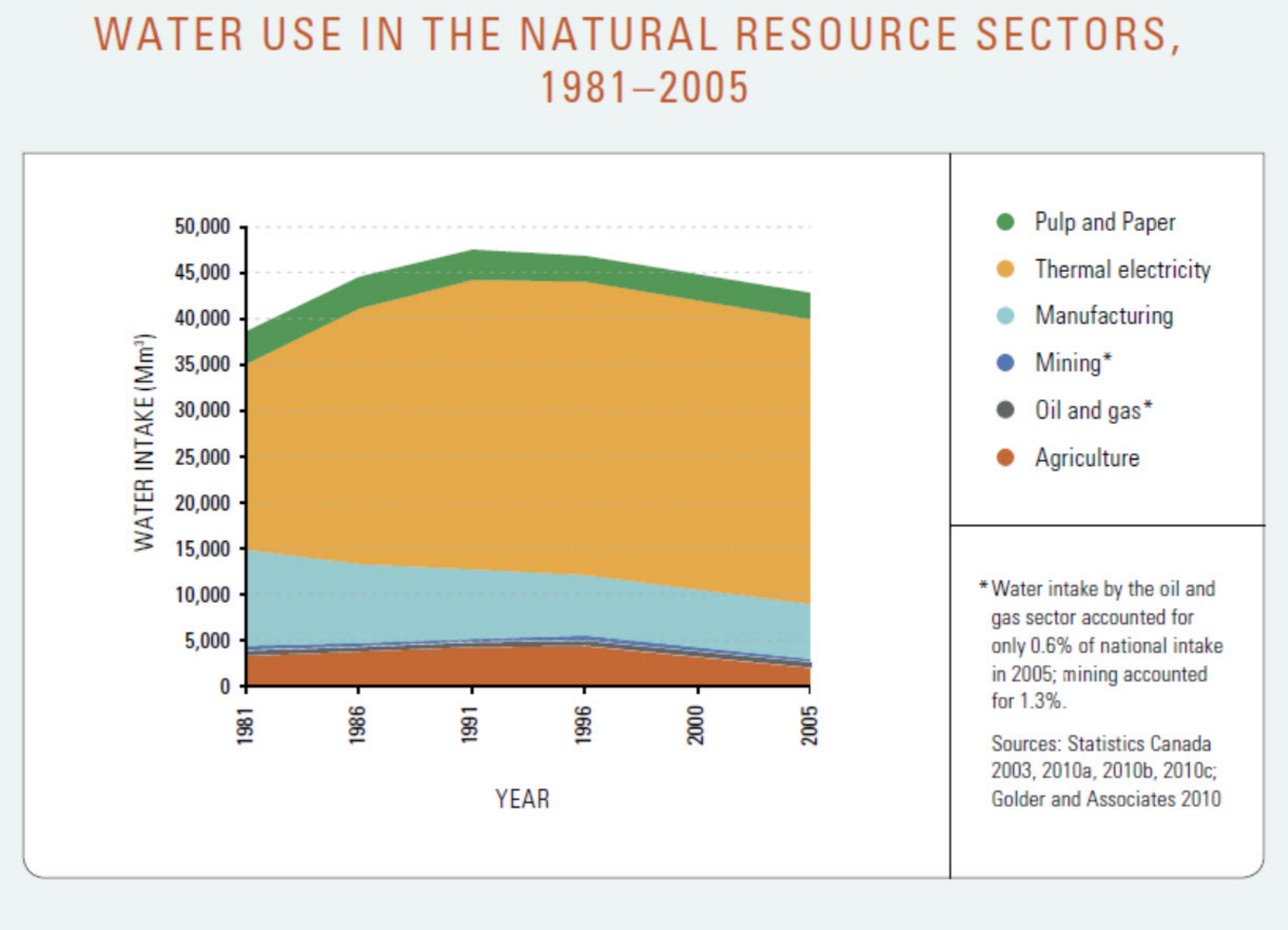
Sources: Industry Canada; The Conference Board of Canada.

Canadian water use by sector

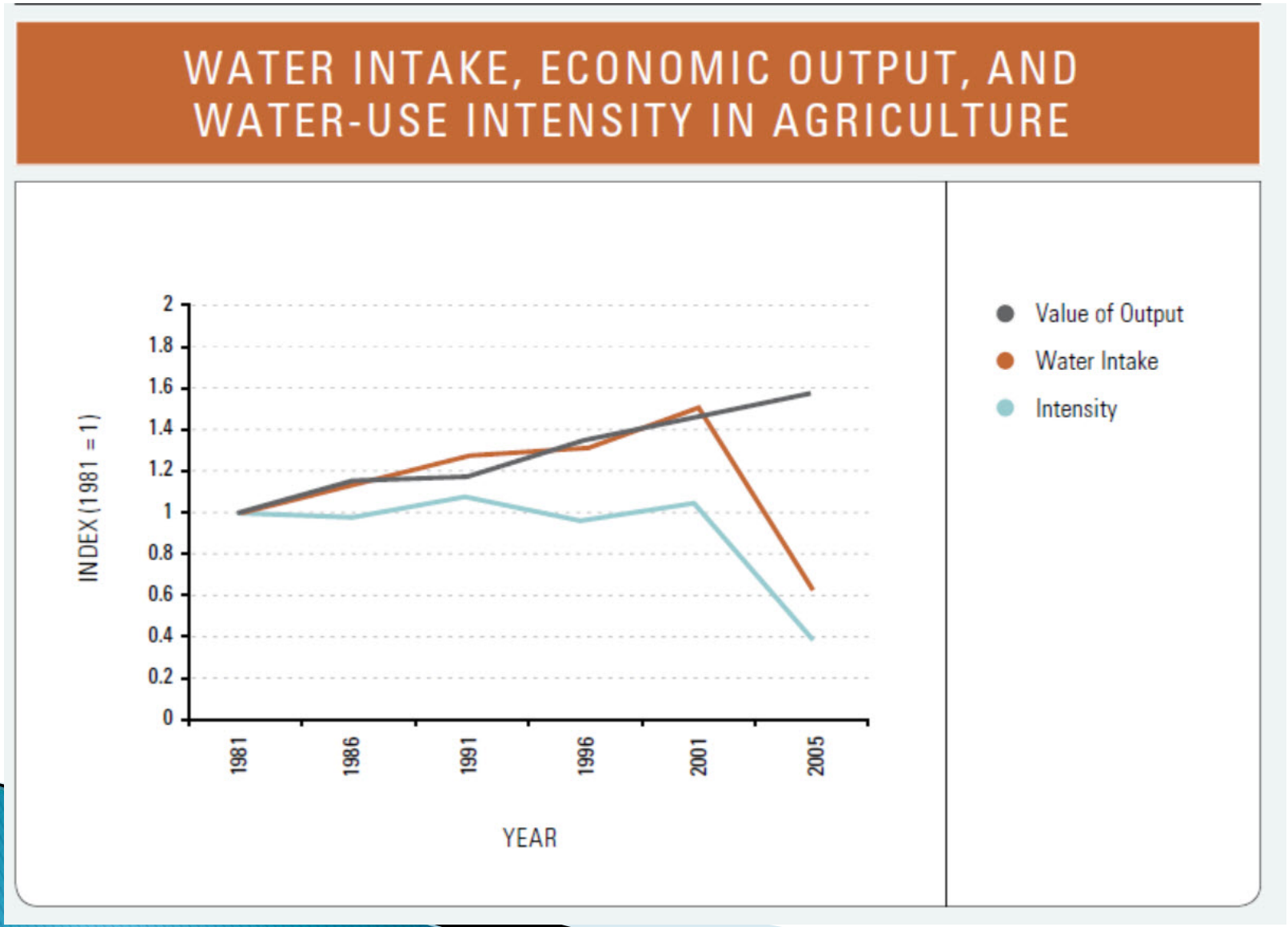
Water withdrawal by sector in Canada, 2004 to 2009



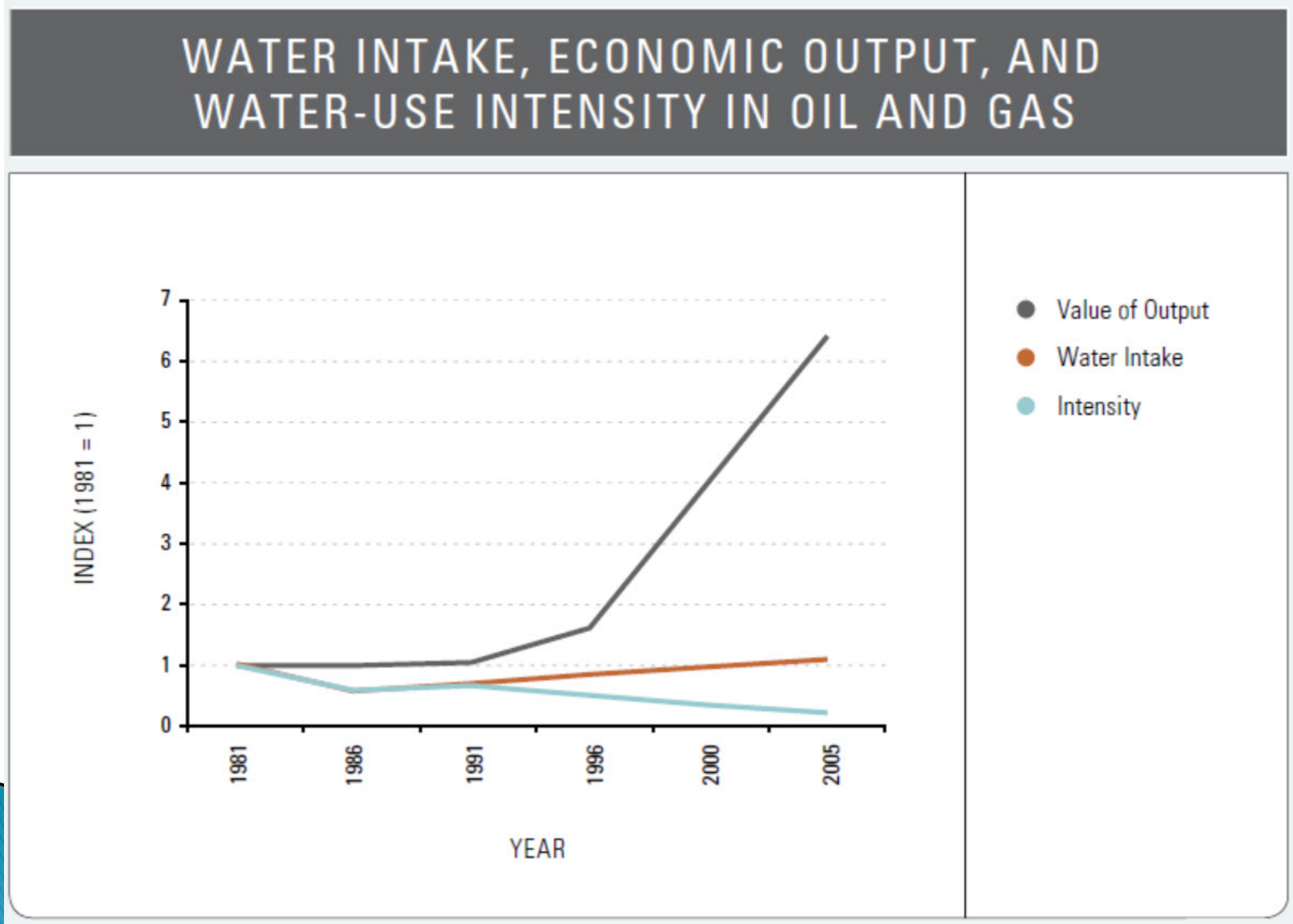
Water use in Canada's NR sectors



Water use in Canada's NR sectors



Water use in Canada's NR sectors



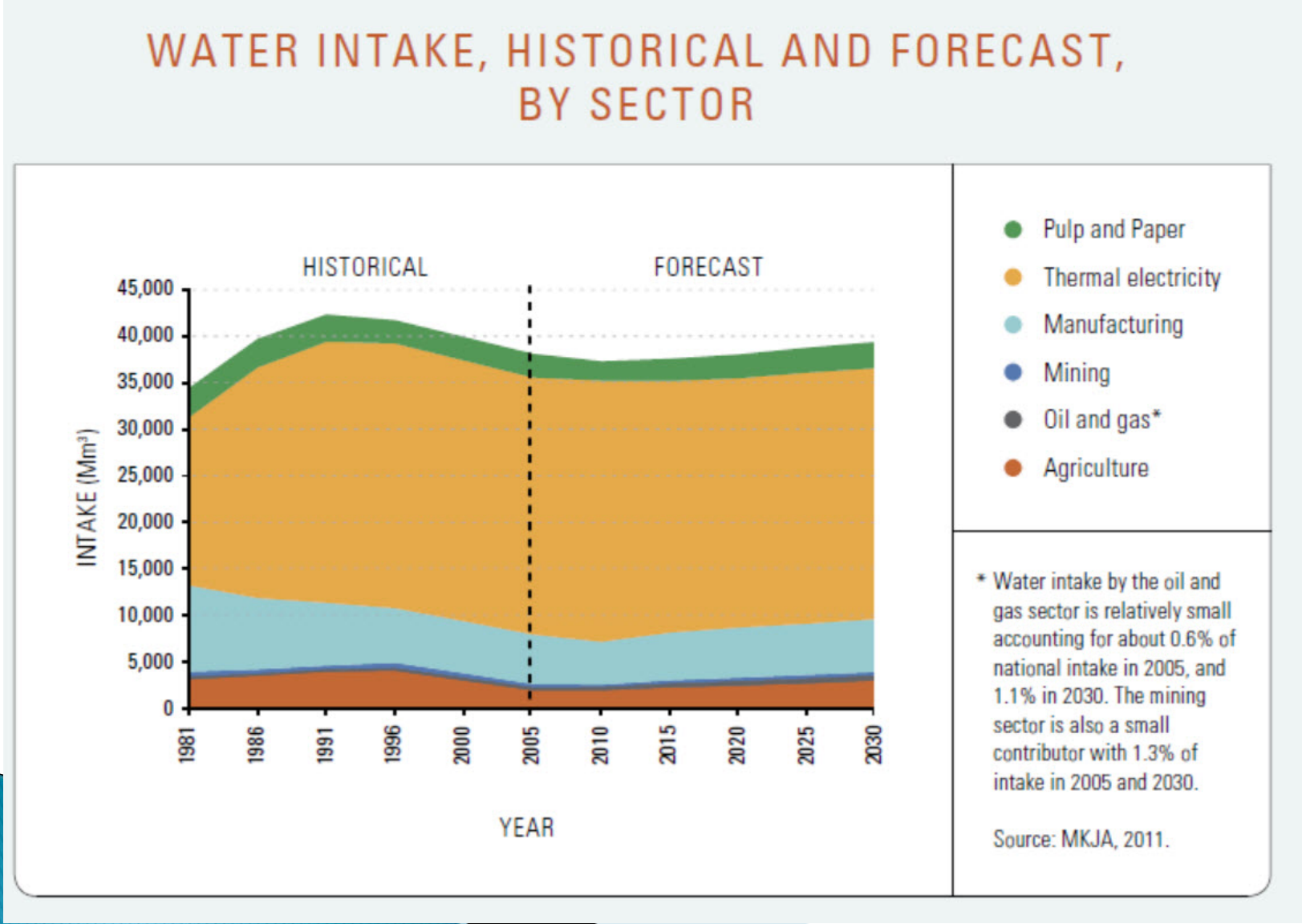
Water use in Canada's NR sectors

OVERVIEW OF WATER INTAKE FORECASTS TO 2030, BY SECTOR (Mm^3)

SECTOR	WATER INTAKE 2005	WATER INTAKE 2030	SECTOR CHANGE 2005 TO 2030	SHARE OF TOTAL NR INTAKE, 2005	SHARE OF TOTAL NR INTAKE, 2030
Oil and Gas	203	396	96%	0.6%	1.1%
Mining	456	478	5%	1.3%	1.3%
Agriculture	1,953	3,017	54%	5.5%	8.2%
Manufacturing	5,362	5,744	7%	15.0%	15.6%
Thermal electric	27,825	27,151	-2%	77.7%	73.8%
Total	**35,799**	**36,787**	**3%**	**100%**	**100%**

Source: Statistics Canada (2010b), CAPP (2010); Forecast from MKJA (2011).

Water use in Canada's NR sectors

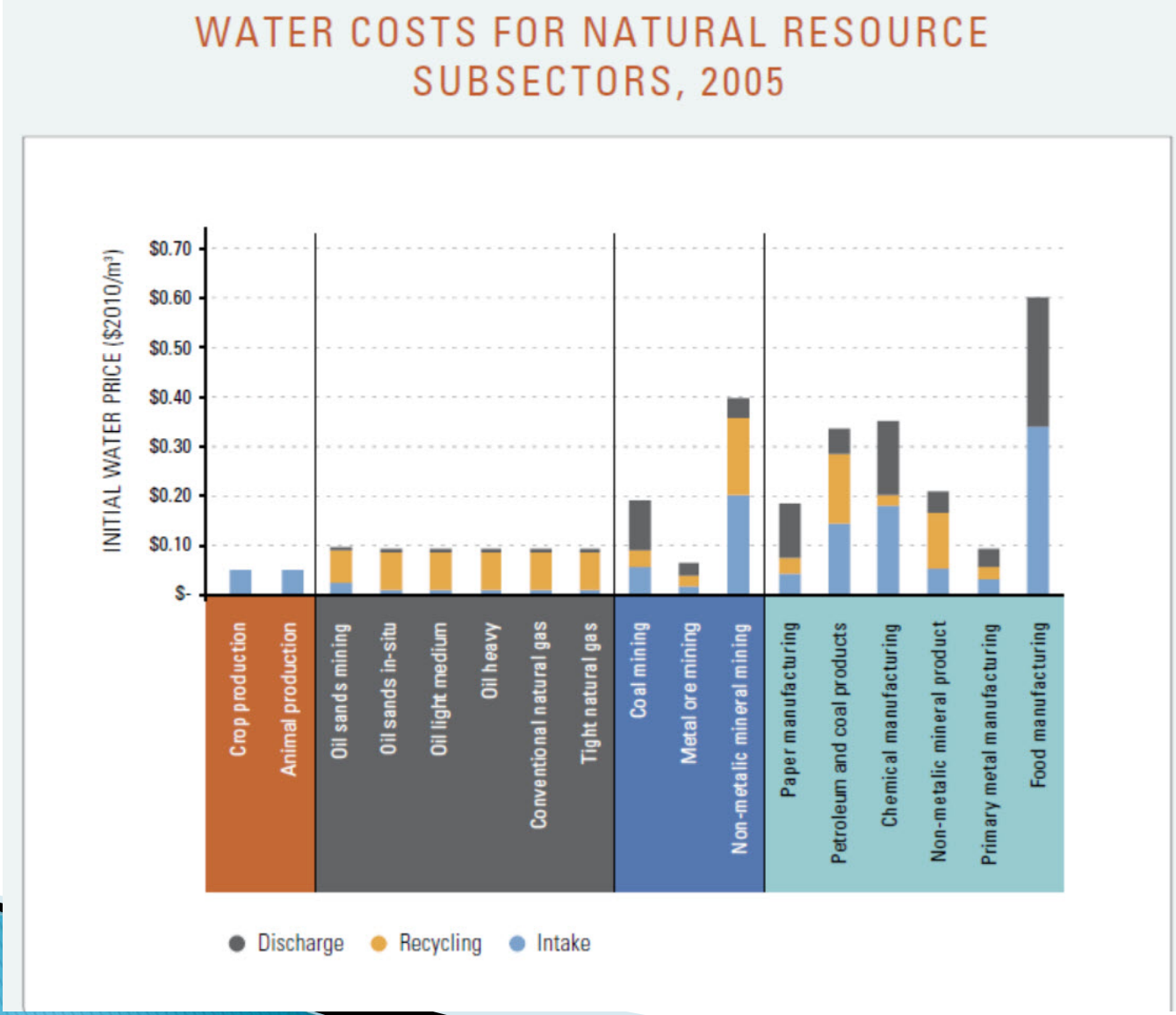


Water use in Canada's NR sectors

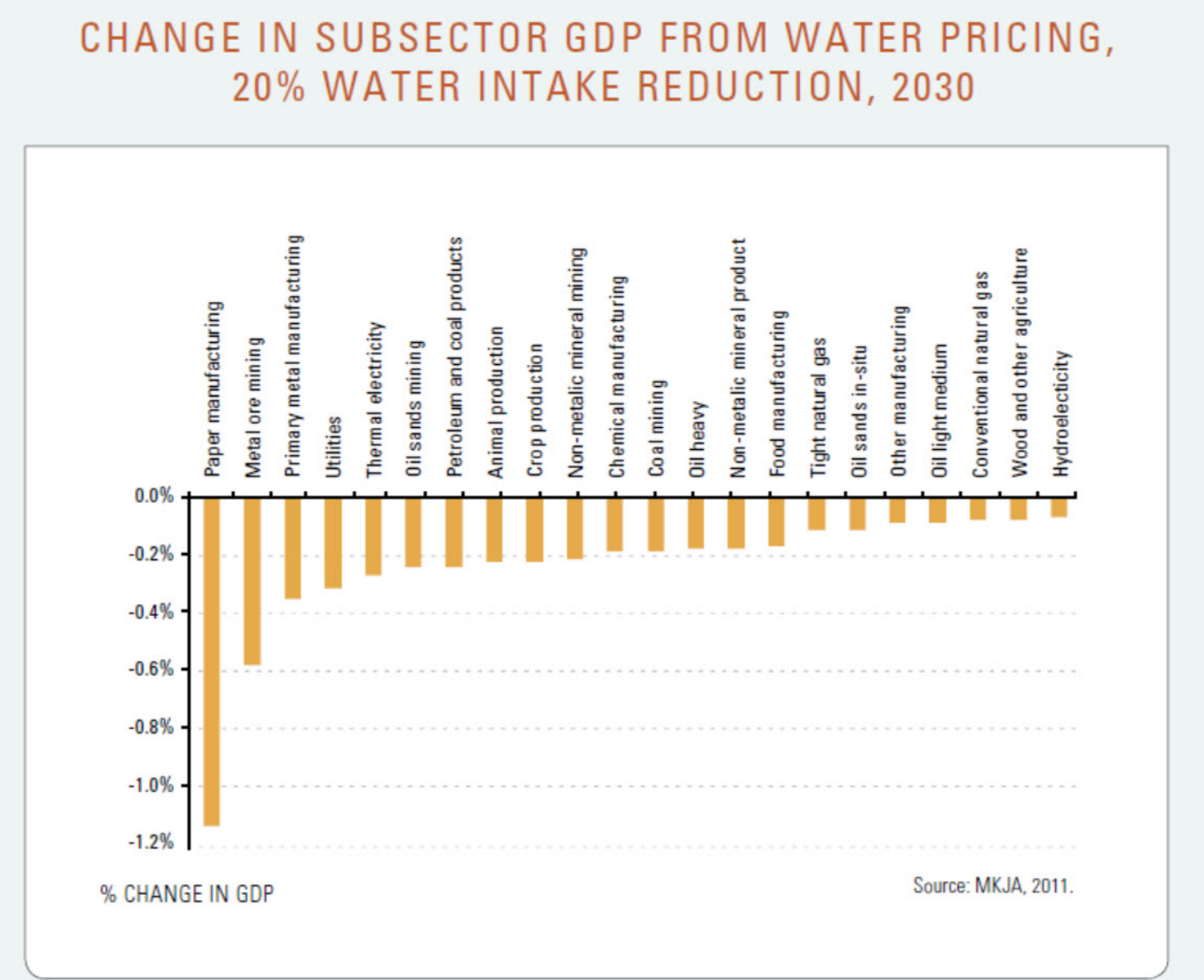
WATER COST DATA, 2005 (CENTS PER m^3)

SECTOR	Operation and maintenance (excluding treatment)	Licence fees	Intake treatment	Recircu-lation	Discharge treatment	Gross water use*
Thermal electric power generation	0.1	-	0.1	0.1	0.1	0.3
Mining	9.8	0.2	5.0	3.4	7.7	7.5
Manufacturing	3.2	-	5.2	7.8	10.6	14.4
Agriculture	3.7	0.1	NA	NA	NA	3.7
Oil and gas	3.7	0.1	5.2	6.2	10.2	6.6

Water use in Canada's NR sectors

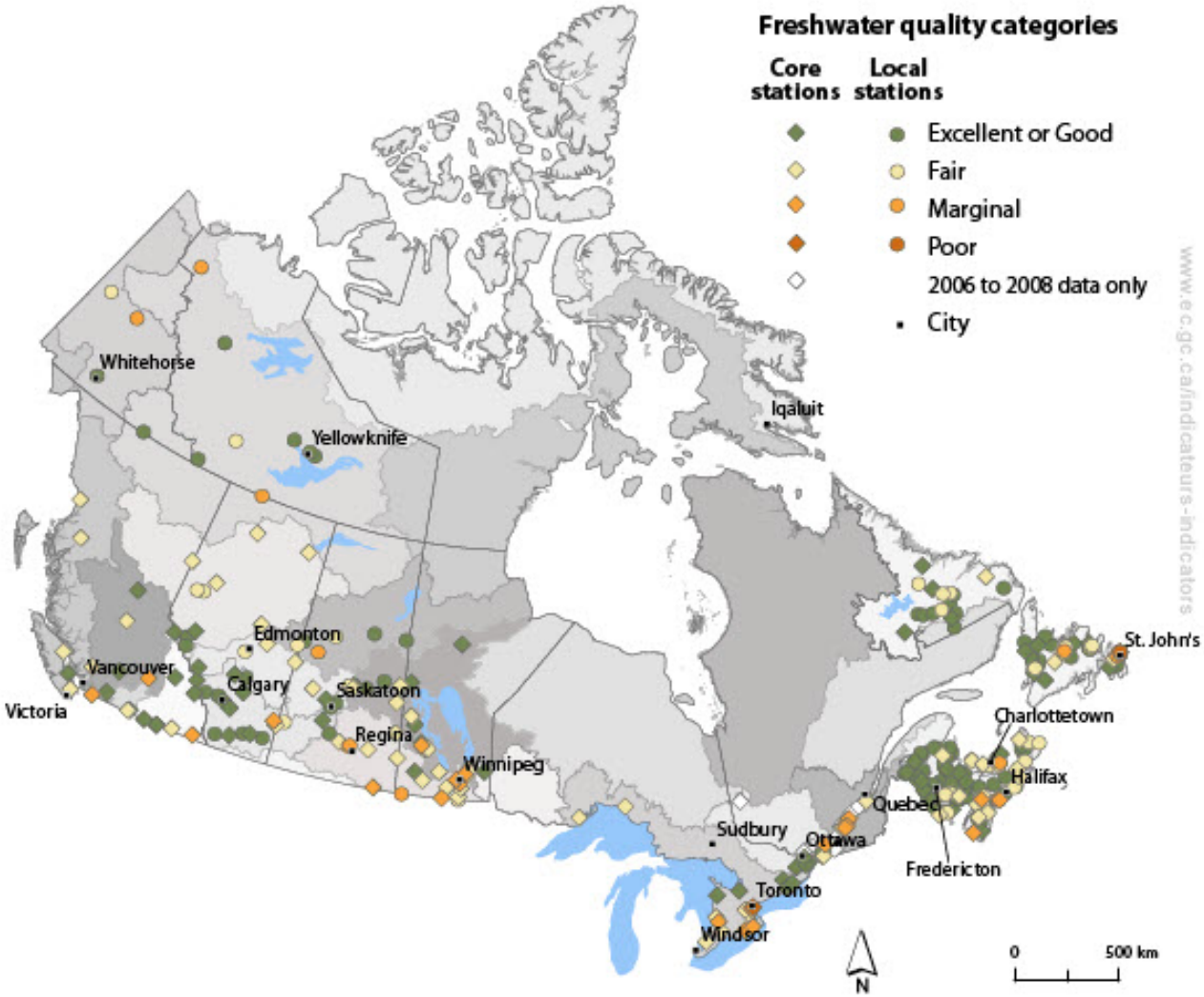


Water use in Canada's NR sectors



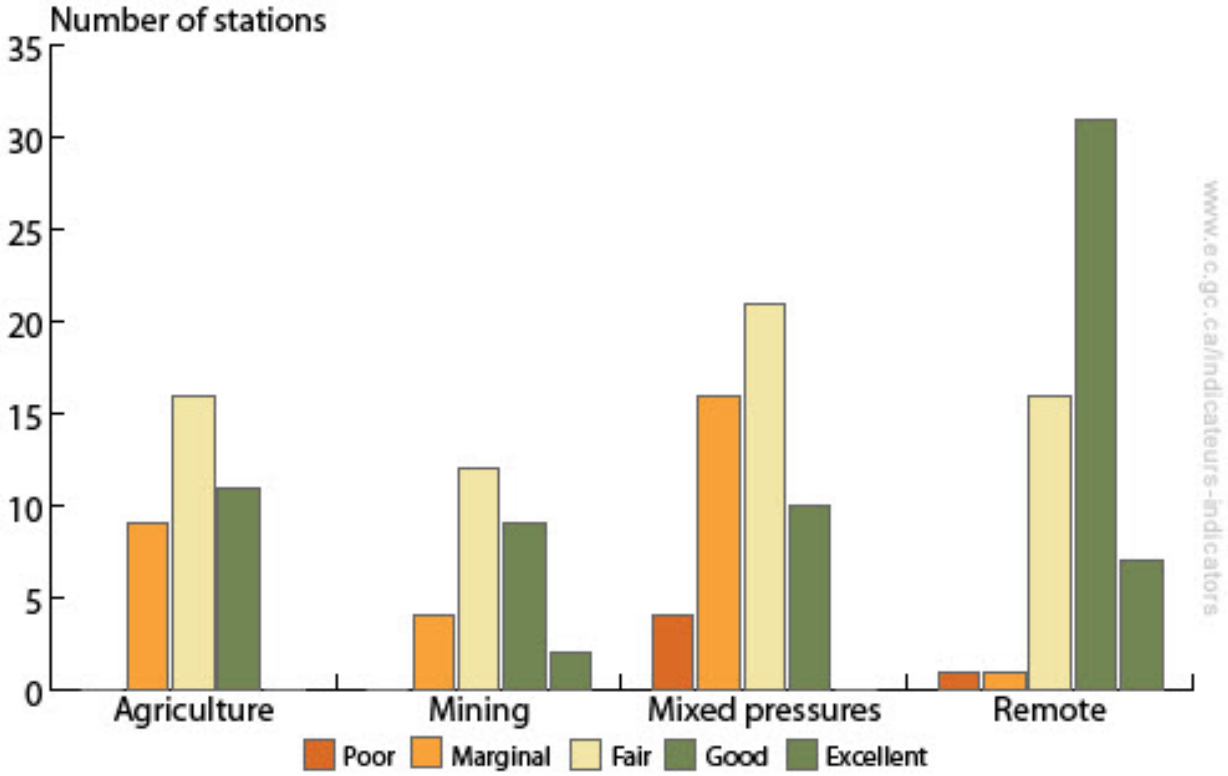
Water quality

Freshwater quality at monitoring stations for the 2007 to 2009 period, Canada



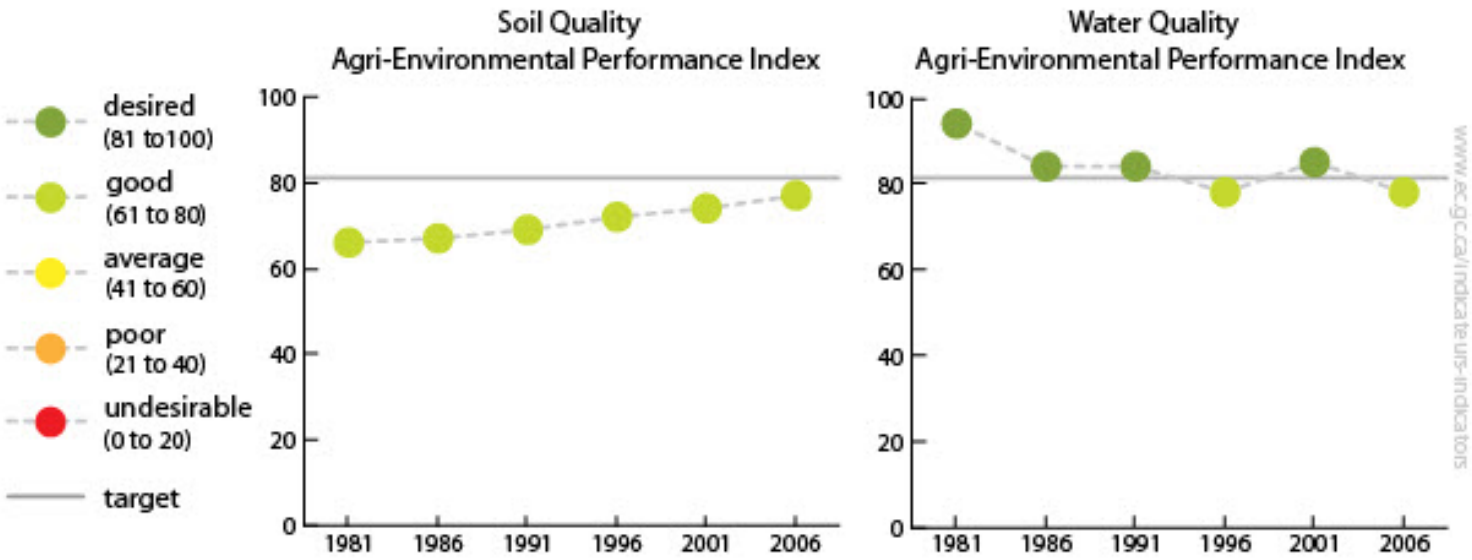
Water quality

Freshwater quality by land use category for the 2007 to 2009 period, Canada



Water quality

Agri-environmental performance indices for soil and water quality in Canada, 1981-2006



Water quality

Summary

- Canadian NR sectors have decreased water intensities significantly in past and are forecasted to continue in future
- Exception is oil and gas
- Pricing can have significant impact on future NR water use with modest cost impacts
- Big concern is lack of regulatory framework to address quality issues- (a) monitoring of oil sands, (b) agricultural non-point source

Moving forward

- Expanded monitoring
- Regulation for non-point sources
- Improved valuation
- Pricing of water (and carbon) for conservation and innovation

Thank you

Water use in Canada's NR sectors

FORECAST OF WATER-USE INTENSITY
(1,000 m³ PER $ MILLION OUTPUT)

SECTOR	INTAKE INTENSITY				CHANGE [1]		TOTAL PER CENT CHANGE	
	1981	2000	2005	2030	1981* to 2005	2005 to 2030	1981* to 2005	2005 to 2030
Agriculture	**140.6**	**x**	**55.6**	**54.2**	**-84.9**	**-1.4**	**-60%**	**-2%**
Crop production	276.2	x	93.0	93.0	-183.2	0.0	-66%	0%
Animal production	16.3	x	18.3	18.1	2.0	-0.2	12%	-1%
Oil and Gas	**x**	**1.9**	**1.9**	**2.9**	**0.0**	**1.0**	**-2%**	**52%**
Oil sands mining	x	12.5	10.2	8.3	-2.3	-1.9	-18%	-18%
Oil sands in-situ	x	1.5	1.4	0.8	-0.2	-0.5	-10%	-39%
Oil light medium	x	1.6	1.5	1.1	-0.2	-0.4	-10%	-24%
Oil heavy	x	1.6	1.5	1.1	-0.2	-0.3	-9%	-23%
Conventional natural gas	x	0.2	0.1	0.2	0.0	0.1	-21%	40%
Tight natural gas	x	0.2	0.1	0.2	0.0	0.1	-21%	40%
Shale natural gas	x	0.0	0.0	0.2	-	0.2	-	-
Mining	**37.8**	**x**	**18.7**	**15.0**	**-19.2**	**-3.7**	**-51%**	**-20%**
Coal mining	22.2	x	7.3	6.1	-14.9	-1.2	-67%	-16%
Metal ore mining	50.4	x	25.6	22.9	-24.8	-2.7	-49%	-11%
Non-metallic mineral mining	17.1	x	11.1	7.6	-6.0	-3.5	-35%	-32%
Manufacturing	**45.1**	**x**	**19.2**	**14.7**	**-25.9**	**-4.5**	**-57%**	**-23%**
Paper manufacturing	130.8	x	76.9	73.1	-53.9	-3.8	-41%	-5%
Primary metal manufacturing	61.3	x	32.3	25.3	-29.0	-7.0	-47%	-22%
Chemical manufacturing	102.9	x	9.2	7.5	-93.7	-1.7	-91%	-19%
Petroleum and coal products	8.9	x	6.0	5.1	-2.9	-0.9	-32%	-16%
Food manufacturing	6.1	x	4.2	3.3	-1.8	-1.0	-30%	-23%
Non-metallic mineral product	10.3	x	4.7	3.5	-5.6	-1.2	-54%	-25%
Thermal electricity	**2,348**	**x**	**1,965**	**1,564**	**-382**	**-401**	**-16%**	**-20%**

Water quality

Freshwater quality in drainage regions for the 2007 to 2009 period, Canada